PATENT
Attorney Docket No.: AM2119/T21300
TTC No.: 16301M-021300

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re application of:

Karl Littau et al.

Application No.: 08/893,917

Filed: July 11, 1997

For: REMOTE PLASMA CLEANING SOURCE HAVING REDUCED REACTIVITY WITH A SUBSTRATE PROCESSING CHAMBER

Examiner: Rudy Zervigon

Art Unit: 1763

APPELLANT'S REPLY BRIEF UNDER 37 CFR § 1.193 (b)(1)

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

In response to the Examiner's Answer mailed on December 8, 2000 to the Appeal Brief filed on September 7, 2000, Applicants respectfully request the Board of Patent Appeals and Interferences to consider the following remarks. This Reply is submitted in triplicate, and is believed to be proper pursuant to 37 CFR § 1.193(b)(1).

A. The Examiner's Characterization of Kawamura and Moslehi as Teaching Anterior Mixing of a Flow of Reactive Radicals and a Nonplasma Diluent Gas Flow Is Erroneous

The Examiner's rejections are based largely on the erroneous assertion that Kawamura and Moslehi disclose anterior mixing of a flow of reactive radicals and a nonplasma diluent gas flow.

The Examiner makes the following allegation regarding Kawamura: "The anterior mixing point in Kawamura apparatus is within the buffer chamber (item 30). This mixing point is separated from, and thus anterior to, the processing chamber (item 10)." Answer, at page 5, lines 2-4. The Examiner further alleges that the "anterior mixing point in the Moslehi apparatus is within the discharge cavity (item 28)." Answer, at page 7, line 6-7. The definition the Examiner uses for "anterior" is "situated before or towards the front." Answer, at page 6, line 1.

Kawamura, however, states that the "buffer chamber 30 is provided at the upper center zone **within** the vacuum chamber 10" (col. 3, lines 46-47) (emphasis added). Because the buffer chamber 30 is within the vacuum chamber 10, it cannot be anterior to the vacuum chamber 10. Moreover, claim 1 recites mixing a flow of reactive radicals and a nonplasma diluent gas flow anterior to the chamber to form a gas-radical mixture, and flowing the gas-radical mixture into the chamber. Nothing in Kawamura suggests forming a gas-radical mixture anterior to the chamber. Instead, Kawamura discloses flowing plasma activated species into the chamber first, stopping the flow, and then flowing the Ar gas into the chamber (see Abstract; col. 6, lines 5-23). There is no mixing of a flow of reactive radicals and a nonplasma diluent gas flow anterior of the chamber to form a gas-radical mixture.

Moslehi also fails to teach or suggest the anterior mixing as recited in the claims. In Moslehi, "[m]icrowave source 26 and discharge cavity 28 are used to provide a remotely-generated plasma stream for gases injected via plasma gas manifold 24." The discharge cavity 28 is used to activate the gases flowing into therein by the microwave source 26 to generate the plasma stream for the plasma gas manifold 24. A separate nonplasma manifold 22 is provided for introducing nonplasma gases into the chamber. The discharge cavity 28 does not provide mixing of a flow of reactive radials and a nonplasma diluent gas flow anterior of the chamber to form a gas-radical mixture. In Moslehi, either both the digermane gas and additives and the inert gases flow through the plasma gas tube to produce a remote plasma stream of the gases into the chamber, or the non-plasma digermane gas and additives are introduced into the afterglow of the inert gas plasma discharge in the chamber (col. 11, line 22, to col. 12, line 10).

In short, not only do Kawamura and Moslehi fail to teach what the Examiner alleges, but they disclose processes and gas flows that preclude the mixing of a flow of reactive radials and a nonplasma diluent gas flow anterior of the chamber to form a gas-radical mixture.

B. The Examiner's Reliance on Selected Portions of the References Without Taking into Consideration Their Fair and Actual Teachings as a Whole Is Misleading

The Examiner selectively cites portions of the references to support the rejections while disregarding the actual teachings of the references. It is impermissible to pick and choose isolated statements from a reference out of context to the exclusion of other parts necessary to the full appreciation of what the reference fairly teaches. *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 230 U.S.P.Q. 416, 419 (Fed. Cir. 1986); *see also In re Evanega*, 4 U.S.P.Q.2d 1249, 1251 (Fed. Cir. 1987) (reversing the Board on the ground that it failed to consider a prior art reference in its entirety). In *Bausch & Lomb*, the court found that a single statement was taken out of the patent specification to support an assertion, while a full appreciation of the statement required consideration of the immediately following sentences and contradicted that assertion. 230 U.S.P.Q. at 419.

The Examiner in this case has committed a similar error. For instance, the Examiner cites column 12, line 1 of Moslehi as disclosing 25,000.25 sccm nonplasma gas flow rate and cites column 11, line 68 as disclosing a 100 sccm in rejecting dependent claims 7 and 10. Answer, at page 9, lines 9-11, and page 14, lines 12-14. Claims 7 and 10 depend from claims that recite anterior mixing of reactive radicals and nonplasma diluent gas anterior of the chamber to form a gas-radical mixture. The cited flow rates are used in a very different process from that recited in the claims. Moslehi at column 11, line 66, to column 12, line 3, however, states:

> As an example, plasma activation can be accomplished by: (a) injecting an inert gas (such as Ar or He) plasma stream of about 100-1500 sccm, and **then** (b) introducing the basic Ge_2H_6:H_2 0.25:25000 sccm non-plasma cleaning process gas stream **into the afterglow of the plasma discharge inside the process chamber**. (Emphasis added)

It is clear from the statements, when read in context, that there is no mixing of reactive radicals and nonplasma diluent gas anterior of the chamber to form a gas-radical mixture. Any mixing that may occur takes places "**inside** the process chamber" (col. 12, line 3). The Examiner picks and chooses portions of Moslehi that support his allegations and ignores those portions that contradict the allegations.

C. Kawamura and Moslehi, When Considered As a Whole, Fail to Teach or Suggest the Anterior Mixing of a Flow of Reactive Radicals and a Nonplasma Diluent Gas Flow

Embodiments of the present invention provide mixing of a nonplasma diluent gas with a flow of reactive radicals produced by a plasma remotely disposed with respect to the chamber, at a point anterior to the chamber. This produces a gas-radical mixture which allows increasing the flow rate of a gas through the chamber, while decreasing the rate at which materials located within the chamber are etched by the reactive radicals dispersed within the gas-radical mixture.

Kawamura and Moslehi do not teach or suggest the anterior mixing as recited in the claims. The Examiner crafts the rejections by picking and choosing isolated statements while ignoring the fair and accurate teachings of these references. In *In re Wright*, 9 U.S.P.Q.2d 1649, 1652 (Fed. Cir. 1989), the court faults the examiner and the Board because "they overlook or purposely ignore" the fair teaching of the patent specification. Similarly, the Examiner in this case has focused his attention on isolated statements of the references to the exclusion of other parts necessary to the full appreciation of what the references fairly teach.

For example, Kawamura discloses a method for etching an SiO_2 film by flowing plasma-activated species of an NF_3/H_2 mixture as a feed gas for an etchant for etching SiO_2 on a silicon wafer, and stopping the flow. "**Then** the absorbed activated species are irradiated with Ar low energy ions so that the activated species are excited and etch the SiO_2 film." Abstract (emphasis added). When considered as a whole, Kawamura discloses sequential flows of plasma-activated species and then Ar, with no mixing of a flow of reactive radicals and a nonplasma gas flow anterior of the chamber.

Moslehi also fails to teach or suggest mixing a nonplasma gas flow with a flow of reactive radicals to form a gas-radical mixture anterior to the chamber. Instead, Moslehi

discloses either introducing digermane gas and additives with inert gases in a remote plasma stream through the plasma gas tube 24 into the chamber, or using an inert gas plasma through the plasma gas tube 24 to excite downstream non-plasma digermane gas and additives introduced via the nonplasma gas manifold 22 into the afterglow of the plasma discharge of the plasma gas tube 24 inside the chamber (col. 11, lines 37-44). Either both the digermane gas and additives and the inert gases flow through the plasma gas tube to produce a remote plasma stream of the gases into the chamber, or the non-plasma digermane gas and additives are introduced into the afterglow of the inert gas plasma discharge in the chamber. In each case, there is no mixing of a nonplasma gas flow and a flow of reactive radicals to form a gas-radical mixture anterior to the chamber.

Applicants respectfully urge the Board to consider the references as a whole. In so doing, Applicants believe the Board will find that the rejections have no merit.

X. CONCLUSION:

In view of the foregoing, Applicants respectfully submit that the claims are in condition for allowance, and respectfully request that the rejections of these claims be reversed.

Respectfully submitted,

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